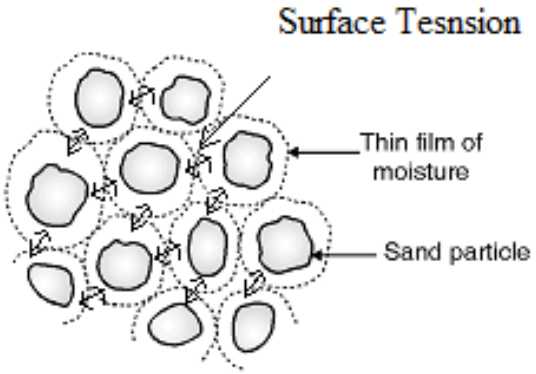
Model Answer: Summer 2018

Subject: Concrete Technology | **Sub. Code: 17504**

Important Instructions to examiners:

1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given more importance. (Not applicable for subject English and Communication Skills.)
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by the candidate and those in the model answer may vary. The examiner may give credit for any equivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and the model answer.
6) In case of some questions credit may be given by judgment on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q. 1	**(A)**	**Attempt any THREE of the following :**		**12**
	(a) Ans.	**State test procedure to find initial setting time of cement.** **Laboratory method to find initial and final setting time of cement-** i. Take 400 gm. of cement sample and add 0.85 times water required for its standard consistency to prepare homogenous cement paste. ii. Note down the time at which water is added to cement as T1 min. iii. Fill this cement paste in Vicat's mould. Keep this mould under Vicat's apparatus. With IST needle attached to it. iv. Now allow the IST needle to penetrate in the paste by realize pin observe the total penetration. If the penetration is not 33 to 35 mm then change the position of penetration surface. v. Note down the time at which IST needle will give required penetration as T2 min. Hence calculate the initial setting time i.e. vi. IST = T2 - T1 min.	**4**	**4**
	(b) Ans.	**Explain with neat sketch the phenomenon "Bulking of Sand".** **Bulking of Sand:** i. Bulking is due to adsorption of moisture on individual sand grains in the form of a thin film. The film of moisture produces surface tension which keeps the sand grains away from each other as shown in figure below. ii. This makes the sand swell and its volume appears more than the actual volume. If the moisture content is increased, the bulking increases up to a certain limit. iii. After this limit, more moisture causes the film to break and at saturation point, all the sand particles lose the film and sink in to the water, so that no bulking is observed.	**3**	

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q. 1		iv . Maximum increase in volume may be up to 20 to 40% when moisture content is 5 to 10% by weight.  	1	4
	(c) Ans.	**State classification of aggregate with respect to shape and size.** **Classification of aggregate according to shape:** **i. Rounded:** This type of aggregate is completely shaped by attrition or water worn. Hence it possess 33-35% void ratio. This type of aggregate is not suitable for concreting. Example: River or sea shore gravel, desert, sea shore, windblown sand etc. **ii. Irregular or partly rounded:** This type of aggregate is naturally irregular or partly shaped by attrition. It possess 35-37% void ratio. Useful for medium quality concrete. Example: Pit sand and gravel, cuboid rock etc. **iii. Angular:** This type of aggregate contains well defined edges, formed at intersection of roughly planer faces. It possesses 38-41% voids. Best for concreting: - Crushed rock of all types. **iv. Flaky and Elongated:** This type of aggregate having small thickness as compared to width or length. It has highest % of voids. It is suitable for lower grade of concrete. Example:- Laminated Rock **Classification of aggregate according to size:** **(1) Fine Aggregate:** The aggregate having size less than 4.75 mm is called as fine aggregate. **(2) Coarse Aggregate:** The aggregate having size more than 4.75 mm is called as coarse aggregate.	2 2	4

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q. 1	(d)	**State maximum water cement ratio for four different grades of concrete as per IS 10262-1982.**		
	Ans.	Maximum water cement ratio for different grades of concrete, which is used in concrete mix design as per IS 10262-1982 are as follows:		

Grade of concrete	M 20	M25	M30	M35	M40
Max. Water cement ratio	0.55	0.50	0.45	0.45	0.40

			1 each (any four)	4
	(B)	**Attempt any ONE of the following**		6
	(a)	**State any four field test of cement. State the precautions to be taken while storing cement at site.**		
	Ans.	**Following are the commonly performed field tests:** i. Open the bag and observe the cement. There should not be any visible lumps. If any lump found it should be powered by pressing between thumb and fore finger if it does not turn into powder the cement is considered have been spoiled by air setting. ii. Thrust your hand into the cement bag, it should feel cool. iii. Rub the cement between finger tips by taking a pinch of the cement. It should not feel gritty but should be smooth in feel. iv. Throw a handful of cement on the water surface in a bucket. The cement should float in case of cement is of good quality and if it sinks it contains some impurities. v. Take 100 gm cement and make a stiff paste by adding very little water. Pat a cake out of this paste on a glass plate. The cake should have sharp edges. Submerge the glass plate with the cake at the bottom of a water bucket. After 24 hours, the cake should not lose its shape and should attain some strength. vi. The colour of cement should be uniformly greenish grey. vii. It should not feel oily when touched.	½ each (any four)	

<table>
<tr><th>Que. No.</th><th>Sub. Que.</th><th>Model Answers</th><th>Marks</th><th>Total Marks</th></tr>
<tr><td>Q. 1</td><td></td><td>Following precautions should be taken while storing cement at site:
i. Cement should be stored in a special water-tight shed with a dry and damp proof door, waterproof walls and leak-proof roof.
ii. The stacks of cement bags should be placed at a distance of at least 30 cm from walls.
iii. A stack should contain maximum 15 bags.
iv. Width of a stack should not exceed 3 m.
v. Bags should be stacked on a raised platform, with sufficient aisles for movement between rows of stacks.
vi. Bags should be stored in such a way that bags received first should be used first</td><td>1 each (any four)</td><td>6</td></tr>
<tr><td></td><td>(b)</td><td>A 2000 gms of air dry coarse aggregate sample is sieved through number of sieves. The test observations are recorded as below. Find fineness modulus.
Observation Table
<table>
<tr><td>I.S. Sieve</td><td>40 mm</td><td>20 mm</td><td>10 mm</td><td>4.75 mm</td><td>2.36 mm</td><td>1.18 mm</td></tr>
<tr><td>Residue (in gms)</td><td>40</td><td>820</td><td>440</td><td>400</td><td>200</td><td>40</td></tr>
</table>
<table>
<tr><td>I.S. Sieve</td><td>600 micron</td><td>300 micron</td><td>150 micron</td></tr>
<tr><td>Residue (in gms)</td><td>00</td><td>40</td><td>20</td></tr>
</table></td><td></td><td></td></tr>
<tr><td></td><td>Ans.</td><td>
<table>
<tr><th>Sieve size</th><th>Wt. retained (gm)</th><th>Cumulative Wt. retained (gm)</th><th>% Cumulative Wt. retained</th></tr>
<tr><td>40 mm</td><td>40</td><td>2</td><td>02</td></tr>
<tr><td>20 mm</td><td>820</td><td>41</td><td>43</td></tr>
<tr><td>10 mm</td><td>440</td><td>22</td><td>65</td></tr>
<tr><td>4.75 mm</td><td>400</td><td>20</td><td>85</td></tr>
<tr><td>2.36 mm</td><td>200</td><td>10</td><td>95</td></tr>
<tr><td>1.18 mm</td><td>40</td><td>02</td><td>97</td></tr>
<tr><td>600 µ</td><td>00</td><td>00</td><td>97</td></tr>
<tr><td>300 µ</td><td>40</td><td>02</td><td>99</td></tr>
<tr><td>150 µ</td><td>20</td><td>01</td><td>100</td></tr>
<tr><td colspan="3">Total cumulative % weight retained</td><td>683</td></tr>
</table>
Fineness Modulus = $\frac{\text{Sum of cumulative \% weight retained up to } 150\mu}{100}$
$= \frac{683}{100} = 6.83$</td><td>4

2</td><td>6</td></tr>
</table>

Q. 2 Attempt any FOUR of the following: — 16

(a) Ans. Enlist the Bogue's compound with formula. — 1 each — 4

Sr. No.	Name of Bogue's compound	Formula
i.	Tri-calcium Silicate	$3\ CaO.SiO_2$
ii.	Di-calcium Silicate	$2\ CaO.SiO_2$
iii.	Tri-Calcium Aluminate	$3\ CaO.Al_2O_3$
iv.	Tetra-Calcium Aluminoferrite	$4\ CaO.Al_2O_3.Fe_2O_3$

(b) Ans. List four types of cement and state their field application. — 1 each (any four) — 4

Types of cement and their field application:

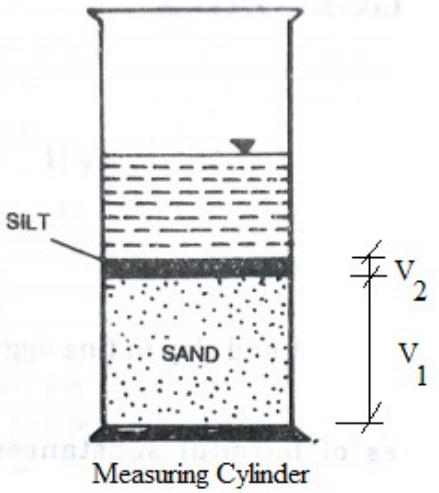
i. Ordinary Portland Cement:
a) Ordinary P.C.C. and R.C.C. construction work.
b) Plastering and water proofing works.
c) Drainage works.

ii. Rapid Hardening Cement:
a) Road construction where delay in traffic is not required.
b) Tremie method of concreting in underwater construction works.
c) Manufacturing of concrete products like fencing pole, electric. pole, doors and windows frames.
d) Cold weather concreting.

iii. Low Heat Cement:
a) Mass concreting works like construction of abutment, retaining wall bridge, dam etc.
b) Construction of chimney of factory.
c) Construction of machine foundations.

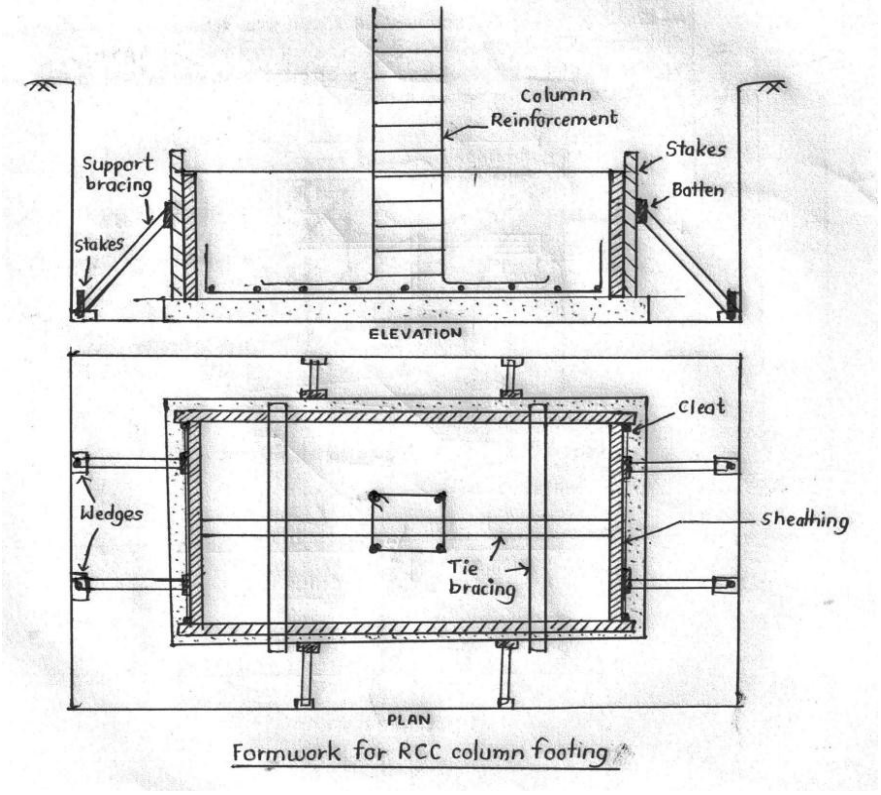
iv. Portland Pozzalana Cement:
a) All construction works where O.P.C. is used i.e. P.C.C. and R.C.C.
b) Construction of hydraulic structure.
c) Mass concreting work.

v. Sulphate Resisting Cement:
a) Construction of foundation on soil and water containing high % of SO4.
b) Marine and seashore construction.
c) Underground laying of R.C.C. pipes in acidic soils.

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q. 2		**vi. Blast Furnace Slag Cement:** a) All construction works where OPC is used. b) Mass concreting. c) Marine works. **vii. White Cement:** a) Decoration works i.e. false ceiling. b) Finishing works i.e. internal plastering. c) Waterproofing works. d) High-class tiling work. ***(Note: Any other type of cement and its application should be considered.)***		
	(c)	**Explain the procedure to determine silt content of sand sample.**		
	Ans.	i. Prepare 1% salt solution by adding 10 gm common salt in 1000 ml water. ii. Fill this salt solution up to 50 ml mark in measuring cylinder. Now add sand sample in it to reach the mixture up to 100 ml mark. Finally add more salt solution to reach total volume up to 150 ml. iii. Shake the mixture vigoursly in both palms. Now keep it at room temperature for 3 hours to separate silt layer above sand sample as shown in fig. iv. Measure the separated volumes of sand and silt as V_1 and V_2 respectively. v. Calculate the silt content of given sand sample in percentage as $(V_2/V_1) \times 100$. The silt content should be less than 6% as per IS (other than road concrete).  Measuring Cylinder	**3** **1**	**4**

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q. 2	(d)	**Explain the procedure to determine the crushing values of aggregate.**		
	Ans.	i. Take the aggregate sample passing through 12.5 mm and retained on 10 mm I.S. sieve. ii. Fill it in crushing mould in three layers by tamping each layer 25 times with tamping rod. iii. Calculate the weight of aggregate filled in mould by subtracting empty weight of crushing mould as 'A' grams. iv. Now keep it under compression testing machine (CTM) with plunger touching to top of aggregates filled. v. Apply the load 40 t uniformly in 10 minutes time. vi. Take out crushed sample and sieve it through 2.36 mm I.S. Sieve. Take the weight of aggregate particles passed through 2.36 mm I.S Sieve as 'B' grams. **vii.** Calculate aggregate crushing value as B/A × 100 in percentage for given aggregate.	**4**	**4**
	(e)	**State the necessity of supervision for concreting operation.**		
	Ans.	**Necessity of supervision for concreting operation:** i. Supervision is necessary to complete all concreting operations in standard manner. ii. It is necessary to avoid any type of delay in concrete work. iii. It is also beneficial to reduce wastage of concrete during concreting. iv. It is required to get overall quality in concrete work at site. v. Supervision becomes essential in maintaining smooth flow of concreting operations at each stage of project. vi. It found very effective in controlling bad workmanship.	**1 each (any four)**	**4**
	(f)	**Define impermeability of concrete. Enlist factors affecting it.**		
	Ans.	**Impermeability:** The resistance to seepage or leakage of water through concrete is called impermeability of concrete.	**1**	
		Factors affecting impermeability of concrete: i. Grading of aggregate. ii. Water-cement ratio. iii. Mixing of concrete ingredients. iv. Use of admixture. v. Proper and uniform compaction. vi. Use of water-proofing compounds. vii. Curing of concrete.	**1 each (any three)**	**4**

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q. 3		**Attempt any FOUR of the following :**		16
	(a)	**Define impact value, Abrasion value, Crushing value and Flakiness index of coarse aggregate.**		
	Ans.	**i. Impact value:** The aggregate impact value gives a relative measure of the resistance of aggregate to sudden shock or impact, which some aggregates differ from their resistance to slow compressive load. **ii. Abrasion value:** It is the resistance of aggregate to wear. It is often considered to know the suitability of aggregates when choice of the aggregate is to be made for concrete to be used for wearing surfaces such as floors, road pavements, runways, etc. **iii. Crushing value:** The aggregate crushing value gives a relative measure of the resistance of an aggregate to crushing under a gradually applied compressive load. **iv. Flakiness index:** The flakiness index of aggregate is the percentage by weight of particles in it, whose least dimension (thickness) is less than three-fifth of their mean dimension.	**1 each**	**4**
	(b)	**Enlist four requirements of good fine aggregate.**		
	Ans.	**Requirements of good fine aggregate:** i. Fine aggregate should be clean i.e. free from silt, lumps, impurities etc. ii. It should be well graded. iii. It should possess less amount of bulking. iv. It should have less water absorption. v. It should have smooth texture to increase workability. vi. It should be hard, strong and durable. vii.It should be chemically inert.	**1 each (any four)**	**4**
	(c)	**Define workability of concrete. Explain workability of concrete with slump test.**		
	Ans.	**Workability:** It is the easiness in handling of concrete mixture for its mixing, transportation, placing and compaction.	**1**	
		Slump Test: i. Clean and apply oil to inner surface of slump cone and place it on non- porous plate. ii. Fill the freshly mixed concrete into cone in four layers. Tamp each layer by 25 times using round headed rod. iii. Remove the excess concrete using trowel. iv. Lift the cone vertically using both handles, so that concrete will subside down. v. Calculate the slump height of concrete as height of cone minus height of concrete subsidence.	**3**	**4**

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q. 3		vi. Degree of workability is proportional to slump height. i.e. very low, low, medium, high and very high.		
	(d) Ans.	**State how compressive strength is determined by using Rebound Hammer.** **Rebound Hammer Test:** i. Initially the plunger of rebound hammer is kept touching to the target concrete surface. ii. Then the tubular casing of hammer is pushed towards concrete, so that the spring gets wind up around the plunger. iii. Now release the mass attached to plunger using dash pot, so that hammer will impact on concrete surface and rebound back depending on strength of concrete. iv. Due to backward motion of hammer, pointer on graduated scale will move in same direction. v. Observe the distance travelled by pointer/rider on graduated scale as Rebound Number. vi. If this Rebound Number is less, then strength of concrete will be less, but if it is more, then concrete possess sufficient strength.	4	4
	(e) Ans.	**Draw a neat sketch of Formwork for R.C.C column footing.**  Formwork for RCC column footing ***(Note : Any one sketch, plan or elevation should be considered.)***	4	4

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q. 4	(A)	**Attempt any THREE of the following :**		12
	(a) Ans.	**Explain in brief IS Method of Concrete Mix Design.** **IS Method of Concrete Mix Design:** The concrete mix design is done by IS 10262-1982 Using following steps: **i. Calculation of target mean strength:** The concrete mix design is done for specific target strength which is calculated first. It is calculated by using formula, $f'_{ck} = f_{ck} + t.S$ Where, f'_{ck} = Target mean strength after 28 days. f_{ck} = Characteristics compressive strength at 28 days. t = Tolerance factor from IS 456. S = Standard deviation from IS 456. **ii. Selection of water-cement ratio:** The w/c ratio is selected from the graph of generalized relationship between w/c ratio and compressive strength. The selected w/c ratio is checked against the limiting w/c ratio and lower of two is adopted. **iii. Selection of water content:** The maximum water content per cubic meter of concrete with nominal maximum size of aggregate s finalized in this step. The water content adopted is used for computing cement content in next step. iv. **Calculation of cementitous material content:** From adopted w/c ratio and selected maximum water content the quantity of cementious materials is calculated. It is checked against the minimum cementitous content for durability requirement ad larger of the two values is adopted as cement content. **v. Calculation of coarse aggregate proportion:** The volume of coarse aggregate per unit volume of total aggregate is chosen in this step based on nominal maximum size of aggregate **vi. Selection of combination of coarse aggregate fractions:** The different sizes viz. 10 mm , 20 mm , 25 mm are taken in proportion from grading , confirming in table 2 of IS 383 **vii. Calculation of fine aggregate proportion:** From above steps, absolute volume of all ingredients of concrete the mix proportion is calculated for said mix design of concrete.	4	4
	(b) Ans.	**Write the precautions to be taken while transporting the concrete.** **Precautions to be taken during transportation:** i. Keep the least possible distance between mixing plant and construction site by establishing the mixing plant nearest to site as far as possible. ii. Avoid atmospheric interaction of concrete by covering it with polythene cover when it is transported through open trucks or dumpers.		

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q. 4		iii. During transportation, wastage of concrete should be avoided. iv. Select the higher w/c ratio for longer transportations and also maintain humid (moist) conditions around concrete (i.e. in case of RMC vehicles) v. Use retarding admixtures in concrete to avoid early hardening of concrete.	1 each (any four)	4
	(c) Ans.	**State advantages and disadvantages of Volume Batching.** **Advantages of Volume Batching:** i. Simple method to execute on site as compared to weigh batching. ii. Weighing balance and other related tools are not required. iii. Iron pan or gauge boxes are required for measuring ingredients which are easily available on site. iv. It requires less time as compared to weigh batching. v. Even unskilled labours perform volume batching.	1 each (any two)	4
		Disadvantages of Volume Batching: i. If fine aggregate containing moisture, then more aggregate is required to add for bulking correction. ii. Volume batching is not preferred for big and quality work. iii. If volume of ingredients is not measured accurately, it gives different results for each batch. iv. It is not good method for proportioning the material because of the difficulty it offers to measure angular materials in terms of volume. v. Less accurate than weigh batching.	1 each (any two)	
	(d) Ans.	**Explain in brief 'Super plasticizers'.** **Super plasticizers:** These are the water reducing admixtures added in concrete.	1	
		Properties of Super plasticizers: i. It reduces water up to 30% without reducing workability. ii. It produces more workable concrete at the same w/c ratio and same workability. iii. It gives homogeneity to mixture without segregation and bleeding. iv. It facilitates good pumpability to concrete with less w/c ratio.	1½	
		Uses of Super plasticizers: i. It is useful in self-leveling and self-compacting concrete. ii. It is helpful to produce pumped concrete for high rise buildings, long span bridges, etc. iii. It is also used in ready mix concrete and in high performance concrete.	1½	

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q. 4	(B)	**Attempt any ONE of the following :**		6
	(a)	**Define compressive strength of concrete. Write the procedure for determination of compressive strength of concrete cubes.**		
	Ans.	**Compressive strength of concrete:** The resistive capacity of concrete cube of 150mm side after 28 days complete curing against compressive load is known as compressive strength of concrete and is measured in N/mm^2.	1	
		Procedure to determine compressive strength of concrete cubes: i. Take three cubes of 15 cm sides and apply oil to its inner surface ii. Prepare the concrete mixture of required grade and fill it in each mould in 3 layers. Compact each layer 25 times with 16 mm dia. steel rod. iii. Keep all the moulds at room temperature for 24 hrs for initial hardening and at relative humidity 90%. iv. Remove cube moulds and keep concrete cubes under fresh water for curing for 7, 14, 21, 28 days. v. Remove cube from water after curing period and keep it under compression testing machine (CTM) for testing. vi. Apply load at a rate of 35 N/mm^2/min for 10 minutes or till failure load in N by cross sectional area of cube in mm^2. vii. Finally calculate compressive strength of cubes as failure load in N by cross sectional area of cube in mm^2. viii. The average of three test cubes can be calculated as average compressive strength in MPa.	5	6
	(b)	**Explain different methods of curing of concrete.**		
	Ans.	**Methods of curing:** I. Water curing. II. Membrane curing. III. Application of heat. IV. Miscellaneous methods.		
		I. Water curing: i. This is the best method of curing, because it satisfies all the requirement of curing. ii. The precast concrete items are normally immersed in curing tanks for certain duration. iii. Pavement slab, roof slab etc. are covered under water by making small pond. iv. Water curing can be done by a) Immersion b) Ponding c) Spraying or fogging. d) Wet covering.		

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q. 4		**II. Membrane curing:** i. Sometimes concrete works are carried out in places where there is acute shortage of water. Therefore lavish application of water for water curing is not possible for the reason of economy. ii. Normally for making concrete more than sufficient water is used to hydrate the cement. But this water should not be allowed to get out from the body of concrete. For this reason concrete can be covered with membrane which will effectively seal the concrete. iii. A membrane will prevent the evaporation of water from the concrete. The membrane can be either in solid or liquid form. It is also known as sealing compound. iv. Other membrane curing sealing compounds are: Rubber latex emulsion, emulsion of resins, varnishes etc. **III. Application of Heat:** i. The development of strength is not only a function of time but also that of temperature. ii. Concrete subjected to higher temperature accelerates the hydration resulting in faster development of strength. iii. Prefabricated members are normally steam cured. iv. In this method the ingredients of concrete heated and the strength is gained at very fast rate. This can be done by a) Steam curing b) Curing by infra-red radiation c) Electrical curing . **IV. Miscellaneous method:** i. Calcium chloride is used either as a surface coating or as an admixture. It has been satisfactorily used as a curing medium. ii. Both of these based on the fact that calcium chloride, being a salt shows affinity for moisture. iii. The salt not only absorbs moisture from atmosphere but also retains it at the surface. The moisture held at the surface prevents the mixed water from evaporation and thereby keeps the concrete wet for a long time to promote hydration.	**6**	**6**
Q. 5		**Attempt any FOUR of the following:**		**16**
	(a) **Ans.**	**Explain in brief procedure for determination of compaction factor of concrete in Laboratory.** Compacting factor of fresh concrete is done to determine the workability of fresh concrete by compacting factor test as per IS: 1199 – 1959. The apparatus used is Compacting factor apparatus. **Procedure to determine workability of fresh concrete by compacting factor test:** i. The sample of concrete is placed in the upper hopper up to the		

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q. 5		brim. ii. The trap-door is opened so that the concrete falls into the lower hopper. iii. The trap-door of the lower hopper is opened and the concrete is allowed to fall into the cylinder. iv. The excess concrete remaining above the top level of the cylinder is then cut off with the help of plane blades. v. The concrete in the cylinder is weighed. This is known as weight of partially compacted concrete. vi. The cylinder is filled with a fresh sample of concrete and vibrated to obtain full compaction. The concrete in the cylinder is weighed again. This weight is known as the weight of fully compacted concrete. $\text{Compaction Factor} = \frac{\text{Weight of partially compacted concrete}}{\text{Weight of fully compacted concrete}}$	4	4
	(b) Ans.	**Define Segregation and Bleeding.** **Segregation:** It is defined as the separation of constituents of concrete from each other. **Bleeding:** It is a particular type of segregation in which excess water comes out to the top surface of concrete.	2 2	4
	(c) Ans.	**State the procedure for joining old and new concrete.** When new concreting is done in continuation with old concrete after a gap of some days, months or even years, then the new and old concrete must have a strong bond with each other. Hence some points should be kept in mind for joining old and new concrete. Method of joining old and new concrete: **i. Cleaning:** The old concrete surface is first thoroughly cleaned with wire brush. Loose material if any, should be removed. **ii. Chiseling:** The old concrete surface is made rough by denting it with a chisel for a strong bond with new concrete. **iii. Application of cement slurry or paste with some admixtures:** The surface is then wetted with rich cement slurry. Sometimes an admixture has to be added to give additional strength to the joints. Then fresh concrete is placed over the old concrete. **iv. Providing overlap:** To give homogeneity to the reinforcing bars, overlap is provided and the overlap portion is bound tightly with high tensile wire.	1 each	4

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q. 5	(d)	**Enlist the effects of HOT weather and COLD weather on concrete.**		
	Ans.	**Effect of hot weather** i. Accelerated settings. ii. Reduction in strength. iii. Increase tendency to cracking. iv. Rapid evaporation during curing. v. Difficulty in controlling the air content.	**1 each (any two)**	**4**
		Effect of cold weather i. Retarding of settings. ii. Reduction in strength. iii. Freezing effect. iv. Time period for removal of form work has to be increased.	**1 each (any two)**	
	(e)	**Enlist the various concrete operation in sequence and explain any one in detail.**		
	Ans.	**Concreting operations:** i. Batching ii. Mixing iii. Transportation iv. Placing v. Compaction vi. Curing vii. Finishing	**2**	**4**
		Curing Curing may be defined as the operation of maintaining humidity and temperature of freshly placed concrete during some definite period following placing, or finishing to assure satisfactory hydration of the cement and proper hardening of the concrete.	**2**	
		Or Curing may be defined as the process of keeping the concrete moist and warm enough so that the complete hydration of the cement can take place **Following are the methods of curing:** i. Water curing ii. Membrane curing iii. Application of heat iv. Miscellaneous methods ***(Note: Explanation of any one operation from above should be considered)***		
	(f)	**Write the purpose of admixture. State any four admixtures used in concrete.**		
	Ans.	**Purpose of admixture:** Some materials are added in concrete to improve few properties and to get required results; these materials added are known as admixtures.	**1**	
		Types of admixtures and its effect on concrete: i. Accelerating admixture ii. Retarding admixtures		

<table>
<tr><th>Que. No.</th><th>Sub. Que.</th><th>Model Answers</th><th>Marks</th><th>Total Marks</th></tr>
<tr><td>Q. 5</td><td></td><td>iii. Water reducing admixtures
iv. Air entraining admixtures
v. Super plasticizers
vi. Pozzolanic admixture
vii. Grouting agents
viii. Bonding admixtures</td><td>½ each (any six)</td><td>4</td></tr>
<tr><td>Q. 6</td><td></td><td>Attempt any FOUR of the following:</td><td></td><td>16</td></tr>
<tr><td></td><td>(a) Ans.</td><td>Compare between tilting and non-tilting types of mixer.
<table>
<tr><th>Sr. No.</th><th>Tilting Mixer</th><th>Non-tilting Mixer</th></tr>
<tr><td>i.</td><td>In this, the drum is conical and revolves about an inclined axis.</td><td>In this, the drum is cylindrical and revolves about horizontal axis.</td></tr>
<tr><td>ii.</td><td>Blades are provided inside the drum so that materials are continuously moved as the drum rotates.</td><td>Blades are provided inside the drum as the drum rotates, blades pickup the concrete and when they reach their highest point concrete drops at the bottom.</td></tr>
<tr><td>iii.</td><td>The drum can be tilted to different positions for charging and discharging of material</td><td>Concrete materials are charged into the drum through one opening and discharged through the other opening.</td></tr>
<tr><td>iv.</td><td>Capacity is less. 100 T, 140 T, 200 T</td><td>Capacity is more. 280 NT, 400 NT, 800 NT</td></tr>
</table></td><td>1 each</td><td>4</td></tr>
<tr><td></td><td>(b) Ans.</td><td>State necessity of water-proofing. Enlist methods of water-proofing
Necessity of water proofing:
i. It reduces permeability as well as damage to structures.
ii. It increases durability and strength.
iii. It keeps good sanitation of building.
iv. It prevents paint and appearance of building from damage.

Methods of waterproofing:
i. Brick bat coba system.
ii. Bituminous treatment.
iii. Box-type waterproofing system.
iv. Sheet membranes.
v. Surface coating/liquid membrane.
vi. Integral method.
vii. Hydrophilic system /crystalline.
viii. Hydrophobic admixtures.
ix. By use of pore fillers.
x. By use of water repellent.</td><td>2

½ each (any four)</td><td>4</td></tr>
</table>

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q. 6	(c) Ans.	**State advantage and limitation of RMC.** **Advantages of RMC:** i. RMC can be ordered in bulk amount at a time. ii. It has more homogeneity as compared to other concrete. iii. It becomes economical in large projects. iv. It can be easily transported at a longer distance without hardening. **Limitations of RMC:** i. RMC is expensive than ordinary concrete, hence suitable for large projects only. ii. Continuous and bulk supply of materials is necessary for smooth working of RMC plant. iii. It may get affected on its quality due to improper functioning of plant elements. iv. It requires skilled labours for operation and it has low profit margin.	**1 each (any two)** **1 each (any two)**	**4**
	(d) Ans.	**Explain in brief 'Fibre Reinforced Concrete'.** When concrete mixture is prepared by adding individual or combination of different types of fibres in it, then such formed concrete is termed as Fibre Reinforced Concrete (FRC). The fibre like asbestos, glass, plastic, steel can be used as reinforcement in concrete to increase various strength characteristics. **Application of FRC**: i. Machine foundations: To resist shock and dynamic loading. ii. Canal lining and precast elements: To gain impermeable finish. iii. Refractory lining: To resist temperature stresses.	**4**	**4**
	(e) Ans.	**State the precaution taken during Hot Weather concrete.** **Precautions to be taken during Hot Weather concrete:** i. During hot weather, transportation of concrete should be done quickly, without delay to avoid hardening of concrete. ii. Concrete should be covered with polythene before and after concreting work to minimize defects. iii. Before placing, water should be sprinkled on ground and formwork to avoid water absorption from concrete mix. iv. Concreting work should be done during night time only. v. Retarding admixtures should be used to reduce rate of setting. vi. Low heat cement should be preferred to minimize heat evolution. vii. High w/c ratio and ice crystals should be used to maintain workability	**1 each (any four)**	**4**

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q. 6	(f)	**Describe the following:** **(i) High Performance concrete** **(ii) Light Weight Concrete.**		
	Ans.	**i. High Performance Concrete:** Properties of High performance concrete: a. High workability b. High strength c. High modulus of elasticity d. More density e. More dimensional stability f. Low permeability g. High resistance to chemical attack	**2**	
		Uses of High Performance Concrete: a. Construction of special structures like atomic power stations, satellite launching station, heavy duty runway, etc. b. Mass concrete structures like dams, bridges, etc.		**4**
		ii. Light Weight Concrete: The concrete whose self-weight is lesser comparative to ordinary concrete is called light weight concrete. This concrete is produced by using light weight aggregates (LWA). The light weight aggregates used may be the natural materials like volcanic pumice, thermal treatment materials like clay, slate or shale or industrial by-product containing fly-ash, slag etc. The property of light weight concrete depends on the properties of light weight aggregates used. If high thermal insulation is required, light and weak aggregates can be used but it results in low strength to concrete. Light weight concrete has following advantages : i. Reduction in dead load gives saving in cost foundation and reinforcement. ii. More thermal and fire resistance. iii. Reduction in transportation and handling cost of precast unit. iv. Reduction in formwork and propping	**2**	